DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers

CECW-EH-W | Washington, DC 20314-1000 | ETL 1110-2-309

Technical Letter
No. 1110-2-309

5 February 1988

Engineering and Design
WATER AND WASTEWATER LABORATORY INSPECTIONS

Distribution Restriction Statement

Approved for public release; distribution is unlimited.

Report Documentation Page

Report Date	Report Type	Dates Covered (from... to)
05 Feb 1988	N/A	-

Title and Subtitle Engineering and Design: Water and Wastewater Laboratory Inspections	**Contract Number**
	Grant Number
	Program Element Number
Author(s)	**Project Number**
	Task Number
	Work Unit Number
Performing Organization Name(s) and Address(es) Department of the Army U.S. Army Corps of Engineers Washington, DC 20314-1000	**Performing Organization Report Number**
Sponsoring/Monitoring Agency Name(s) and Address(es)	**Sponsor/Monitor's Acronym(s)**
	Sponsor/Monitor's Report Number(s)
Distribution/Availability Statement Approved for public release, distribution unlimited	
Supplementary Notes	
Abstract	
Subject Terms	
Report Classification unclassified	**Classification of this page** unclassified
Classification of Abstract unclassified	**Limitation of Abstract** UU
Number of Pages 21	

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, D.C. 20314-1000

CEEC-EH-W

Engineer Technical
Letter No. 1110-2-309

5 February 1988

Engineering and Design
WATER AND WASTEWATER LABORATORY INSPECTIONS

1. Purpose. The purpose of this letter is to provide guidance for conducting inspections of commercial laboratories engaged in the chemical and physical analysis of environmental samples of water, wastewater, and related media for the Corps of Engineers.

2. Applicability. This ETL is applicable to all HQUSACE/OCE elements and field operating activities having civil works responsibility for laboratory inspections.

3. References.

a. ER 1110-1-261

b. ER 1110-1-263

c. ER 1110-1-8100

d. USACE Chemical Quality Management Protocol for Evaluation of Contract Laboratories Providing Analyses for Superfund and Defense Environmental Restoration Account (DERA) Projects, 8 April 1986.

4. Policy. The basic policies concerning inspection of laboratories performing analysis for water and wastewater projects are set forth in references 3a and 3c. Activities involving Superfund and DERA projects are governed by references 3b and 3d.

5. Background. The purpose of laboratory inspections is to assure that laboratories performing analyses for water and wastewater projects have the required capability, are following accepted quality control procedures and are using methods consistent with those contained in documents listed in Enclosure 1 or in contract specifications. Difficulties arising during laboratory inspections are frequently a result of deficient program or contract specifications.

6. Laboratory Inspections.

a. General. Inspections should be performed prior to the initiation of laboratory testing (or award of contract) and at appropriate intervals thereafter. Following each inspection, a report covering observations and recommendations should be provided to the district commander and will

---

This engineer technical letter supersedes ETL 1110-2-268 dated 31 December 1981.

generally include a summary of contract requirements for chemical/physical testing, a completed laboratory evaluation checksheet, and a summary of findings with specific recommendations. If satisfactory performance on audit samples is a contract requirement, an evaluation of the results should be included in the report.

b. Program Specifications. Prior to an inspection, a review of the program and contract specifications should be made to determine requirements for field sampling and analysis, transportation and handling of samples, laboratory analyses, facilities and equipment, personnel, reporting, and quality control. This review will establish the level of detail required in the inspection. Enclosure 2 describes material generally covered in this review.

c. Onsite Laboratory Inspection. When a site visit is planned, arrangements should be made for a schedule that will have a minimum impact on routine activities, allow observation of a variety of tests in actual operation, and assure the presence of the laboratory staff. At the laboratory, an interview is held with the facility director to discuss the purpose of the site visit and to emphasize the Corps requirements for an active quality assurance/quality control program. This is followed by an evaluation survey to determine the laboratory's ability to meet program requirements or contract specifications. A checksheet is presented in Enclosure 3 to aid in this evaluation. It may be necessary to add or delete items based on individual program needs. Note also that much of the information in Enclosure 3 may be obtained before the inspection, either as part of the quality assurance plan required by contract specifications, or by written communication. An exit interview is then held with the laboratory director to discuss observations and make recommendations.

7. Conclusions. The inspection of laboratories to ensure the reliability of environmental data is a very important part of the overall quality assurance plan for the Corps of Engineers. The enclosures provide guidance to assist in carrying out this responsibility. However, variations in funding levels, types of laboratories involved, and analyses required dictate that considerable judgement be exercised by the individuals responsible for the inspection program. All of the information outlined may not be required for each inspection, while additional information may be needed in some cases. Contracts must often be written which require state-of-the-art procedures and this may cause some contracts to be less specific than others. Established methods often allow some discretion on the part of the analyst.

In addition, new equipment can make procedures unnecessary that were previously mandatory. In view of these considerations, inspections should be carried out by personnel qualified in laboratory techniques and knowledgeable regarding acceptable alternative methods.

FOR THE COMMANDER:

3 Encls

HERBERT H. KENNON
Chief, Engineering Division
Directorate of Engineering and
Construction

BIBLIOGRAPHY

1. ETL 1110-2-244, Water and Wastewater Laboratory Quality Control.

2. ETL 1110-2-298, Contracting Guidelines for Water Quality and Other Chemical Analyses.

3. Ecological Evaluation for Proposed Discharge of Dredged Material into Ocean Waters. July 1977. Environmental Protection Agency/Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material, Environmental Effects Laboratory, USAE Waterways Experiment Station, Vicksburg, MS 39180.

4. Ecological Evaluation of Proposed Discharge of Dredged or Fill Material into Navigable Waters. Miscellaneous Paper d-76-17, May 1976, Environmental Effects Laboratory, USAE Waterways Experiment Station, Vicksburg, MS 39180.

5. Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA 600/4/79-019, March 1979, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268.

6. Manual for the Certification of Laboratories Analyzing Drinking Water. EPA 570/9-82-002, October 1982, U.S. Environmental Protection Agency, Office of Drinking Water, Washington, D.C. 20460.

7. Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79- 020, March 1979, U.S. Environmental Protection Agency, Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268.

8. National Handbook of Recommended Methods for Water-Data Aquisition. June 1977, U.S. Geological Survey, MS-417, National Center, Reston, VA 22092.

9. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. USEPA/CE 81-1, May 1981. Environmental Laboratory, USAE Waterways Experiment Station, Vicksburg, MS 39180.

10. Quality Assurance Guidelines for IERL-Ci Project Officers. December 1979. U.S. Environmental Protection Agency, Industrial Environmental Research Laboratory, Cincinnati, OH 45268.

11. Standard Methods for the Examination of Water and Wastewater (16th Edition). American Public Health Association, 1105 18th St., NW, Washington, D.C. 20036.

12. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, November 1986. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. 20460.

Enclosure 1

13. Jones, Jerry N. and Cullinane, M. John. Guidelines for Water Quality Laboratory Operations. July 1985, Environmental Laboratory, USAE Waterways Experiment Station, Vicksburg, MS 39180.

14. Palermo, Michael R., Development of a Modified Elutriate Test for Estimating the Quality of Effluent from Confined Disposal Areas. August 1986, Environmental Laboratory. USAE Waterways Experiment Station, Vicksburg, MS 39180.

15. Waide, Jack B., General Guidelines for Monitoring Contaminants in Reservoirs. February 1986, Environmental Laboratory, USAE Waterways Experiment Station, Vicksburg, MS 39180

CONTRACT, PROJECT, OR PROGRAM SPECIFICATIONS SUMMARY
(For Each Individual Contract, Project, or Program)

1. Contract, Project, or Program No. _____

2. Reviewed by _____

3. Contract, Project or Program Requirements

   a. Field Sampling and Analysis Requirements

      (1) Sampling Sites

      (2) Methods of Collection and Preservation

      (3) Field Analyses-Parameters and Methods

      (4) Sampling Schedules

      (5) Sample Transportation

   b. Laboratory Analysis Requirements

      (1) Quality Control (QC) Plan

      (2) Personnel Qualifications

      (3) Analytical Methods Specified

      (4) Instrumentation Required

      (5) Detection Limits

      (6) Laboratory Data Reporting and Records Keeping

      (7) Reporting Requirements (Progress, Interim, Final and QC)

   c. Other Requirements (i.e., audit samples)

Note: The above outline is a guide and its contents should not be construed as the only requirements that exist in a contract, project, or program. Any other pertinent information not covered in 3a-3b should be noted under 3c, Other Requirements.

Enclosure 2

LABORATORY
EVALUATION CHECKSHEET

LABORATORY: _____
ADDRESS: _____
DATE: _____

LABORATORY PERSONNEL CONTACTED

NAME	TITLE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

EVALUATION PERSONNEL

NAME	TITLE
_____	_____
_____	_____
_____	_____

Enclosure 3

1. ORGANIZATION OF PERSONNEL

Some personnel may occupy more than one position, particularly in small laboratories. The recommended minimum standards for the laboratory director/manager are a bachelor of science degree and 5 years experience. The recommended minimum standards for the chief analyst directing the testing operations are a bachelors degee in chemistry and 2-3 years experience in analyses being performed.

a. Laboratory Director/Manager
   Name: _____
   Education: _____
   Experience: _____

b. Project Manager
   Name: _____
   Education: _____
   Experience: _____

c. Quality Assurance Officer
   Name: _____
   Education: _____
   Experience: _____

d. Chief Classical Inorganic Analyst
   Name: _____
   Education: _____
   Experience: _____

e. Chief Metals Analyst
   Name: _____
   Education: _____
   Experience: _____

f. Chief Organic Analyst
   Name: _____
   Education: _____
   Experience: _____

2. ANALYSTS

Most analysts should have a minimum bachelor of science degree in chemistry or closely related laboratory science and at least one year's experience performing the analyses required in the contract. Personnel interpreting spectra from gas chromatographs or gas chromatograph/mass spectrometers should have a minimum of two and three year's experience, respectively. Some laboratories make extensive use of technicians. Their work should be performed under the direction of a chemist or senior analyst.

a. Name: _____
Education: _____
Experience: _____
Analyses Performed: _____

b. Name: _____
Education: _____
Experience: _____
Analyses Performed: _____

c. Name: _____
Education: _____
Experience: _____
Analyses Performed: _____

d. Name: _____
Education: _____
Experience: _____
Analyses Performed: _____

e. Name: _____
Education: _____
Experience: _____
Analyses Performed: _____

3. SUMMARY OF PERSONNEL

a. Do the personnel assigned to this project have appropriate educational background and experience to successfully fulfill this contract? Explain. _____

_____

b. Is the laboratory adequately staffed to meet time requirements of of the contract? _____

c. Were pertinent personnel available for interview during the inspection? _____

d. Are training programs in effect to keep analysts current in instrumentation, procedures and quality control? _____

e. Are personnel adequately trained in safety procedures? _____

f. Other comments regarding personnel _____

_____

_____

_____

4. SAMPLING

a. Does the contract specify sampling by the laboratory? _____

b. What sampling methods are being used? Do they follow contract specifications? _____

_____

c. What type of sample containers are being used? _____

_____

d. State method used for cleaning containers. _____

_____

e. State preservation methods being used. _____

_____

f. How are samples identified in the field? _____

_____

g. State method used for recording field sampling and analysis. ____

_____

_____

h. What analyses are being performed in the field? _____

_____

i. Are field calibrations required? Explain. _____

_____

j. How are samples transported to the laboratory? Are holding times being met? _____

_____

k. Are blind duplicate and spike samples prepared in the field for laboratory analysis? Are field blanks used? _____

_____

l. Are chain-of-custody procedures being followed if this is required in the contract? _____

m. Other comments regarding sampling _____

_____

5. SAMPLE RECEIPT AT THE LABORATORY

If any analyses are to be subcontracted to another laboratory a separate site inspection is required to evaluate the subcontractor's capabilities.

a. Is a person designated to receive samples into the laboratory?

Name: _____

b. Are written procedures developed for receipt and storage of samples? Are they available at the sample receipt area? _____

_____

_____

c. Is a chain of custody form signed by persons logging in samples if appropriate? _____

d. Is a permanent logbook maintained? Are records kept in ink?

_____

e. Are chain-of-custody seals checked for integrity? _____

_____

f. Does the information on the samples match that in the field notebooks or the sample transmittal sheets? _____

g. Are discrepancies noted in the logbook? _____

h. Are adequate facilities available or sample storage, including refrigerator and freezer space? _____

_____

i. Is a system in effect to assure that the proper cold storage temperature is maintained? _____

_____

j. Other comments regarding sample receipt _____

_____

6. LABORATORY FACILITIES

a. Is the laboratory maintained in a clean and efficient manner? _____

b. Does the laboratory appear to have adequate work space? _____

c. Does the laboratory have sufficient fume hoods? Are they checked periodically for air flow? _____

d. Does the laboratory have safety devices such as eye washes, showers, spill control kits, etc? _____

e. Are laboratory operations adequately separated to avoid cross-contamination? _____

f. Are chemical waste disposal procedures well-defined and followed by the laboratory? _____

g. Is an adequate supply of distilled or deionized water available? Is it checked for purity? _____

h. Is adequate chemical storage available, including solvent cabinets? Are chemicals properly segregated? _____

i. Are chemicals dated upon receipt? _____

j. Are chemicals in use that have passed identified expiration dates? _____

k. Is sufficient glassware available to handle samples specified in the contract? _____

l. Is volumetric glassware of class "A" quality? _____

m. Are instructions for glassware cleaning posted near the wash area? _____

n. Is provision made for standards storage? Inorganics _____ Organics, refrigerated _____

o. Other comments regarding facilities _____

7. INSTRUMENTATION

a. What type of analytical balances are in use? Are they located on vibration-free surfaces away from drafts? _____

_____

b. Are balances checked routinely with class S weights and recorded in a logbook? _____

c. Are balances calibrated and checked annually by a certified technician? _____

d. List other instrumentation.

INSTRUMENT	MODEL	AGE	ANALYSES

e. Are instruments adequate for the analyses to be performed?

f. Have any of the instruments been modified in any way? How?

g. Are manufacturers operating manuals readily available for each instrument?

h. Are calibration protocols available to the operator?

i. Are calibration results maintained in a permanent record?

j. Are instruments under service contract? Which ones?

k. Are permanent service records available?

l. Are instruments properly vented?

m. Additional comments on instruments

8. ANALYTICAL METHODOLOGY

a. List analytical procedures:

ANALYTE	REFERENCE	SPECIFIED IN CONTRACT

b. Do the methods conform to those specified in the contract? _____

c. Are there any deviations to the reference methodology? Explain. _____

d. Are the written procedures readily available to the analysts? _____

e. Do the methods provide the needed detection limits? _____

f. Does the laboratory require strict adherence to specific quality control procedures for each method? _____

g. Are reagent grade or higher purity chemicals used? _____

h. Are fresh analytical standards prepared in keeping with good quality control practices? _____

i. Are the primary standards traceable to NBS or EPA standards? _____

j. Are records of standards preparations maintained in a logbook? _____

k. Do the analysts maintain complete records of analyses with comments and enter data in a neat and accurate manner? _____

l. Additional comments on analyses _____

9. QUALITY ASSURANCE/QUALITY CONTROL

a. Does the laboratory maintain a quality assurance/quality control manuel? _____

b. Does the manual address the following items?

(1) Organization and Personnel
(2) Quality assurance objectives
(3) Sampling procedures
(4) Facilities and equipment
(5) Instrumentation and maintenance
(6) Calibration procedures and frequency
(7) Analytical procedures
(8) Data analysis, validation and reporting
(9) Internal quality control checks
(10) External quality control checks
(11) Corrective action
(12) Record keeping

c. Is this manual readily available to all laboratory personnel?
_____

d. Are duplicate and spike analyses performed on a minimum number of samples (i.e. 10%)? _____

e. Are acceptable criteria developed for duplicate and spike analyses? _____

f. Are quality control charts used? _____
_____

g. Are reagent blank analyses run with each set of samples? ____

h. Are a minimum of three and preferably more standards run to produce standard curves? _____

i. Do routine procedures require that sample concentrations fall within the limits of the standard curves? _____

j. Do supervisory personnel audit laboratory procedures on a routine basis? _____

k. Does the laboratory routinely run standard reference materials to evaluate analytical performance? Are these results documented?
_____

l. Are data calculations checked by a second person? _____

m. Are recoveries of organic surrogates documented? _____

n. Are tuning records maintained for gas chromatograph/mass spectrometers? _____

o. Are raw data and records maintained for the required peiod of time? _____

p. Are quality control data routinely reported? _____
_____

q. Are external standard quality control samples run at least twice each year? _____

r. Additional comments on quality assurance/quality control: ____
_____
_____
_____

10. REPORTING

a. Is a standard reporting format required?_____

b. Is provision made for the submission of raw data and chromatograms if required? _____

c. Is there a specified time frame for reporting data? _____
_____

d. Additional comments on reporting _____
_____
_____